VIRGINIA TECH SEISMIC NETWORK

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TECHNICAL ABSTRACT

The Virginia Tech seismic network contributes to modern seismographic monitoring in the southern Appalachians. The stations have been upgraded with three-component sensors, high-dynamic range capability and digital radio telemetry. Calibrated waveform data in a format compatible with most widely used data analysis software packages are available via the Internet. The network currently consists of 5 stations in western Virginia. Three other station sites are in central Virginia and were operational during part of the project period. During the project period, 10 earthquakes in detected and located in the study area (Virginia and West Virginia). Southeastern U. S. Seismicity Bulletin 32 for calendar year 1997 was prepared during this project period, and distributed to 200 institutions and individuals, and the CNSS Composite Catalog was updated to include that data set, representing the SE authoritative region.

NONTECHNICAL ABSTRACT

The Virginia Tech seismic network continues to provide modern instrumental coverage of seismicity in the southern Appalachians. The stations have been upgraded with three-component sensors, high-dynamic range capability and digital radio telemetry. Calibrated waveform data in a format compatible with most widely used data analysis software packages are readily available via the Internet. During the past year, 10 earthquakes in Virginia and West Virginia were detected and located. The entire catalog of instrumentally detected and located earthquakes for the southeastern U.S. region is now easily accessible to all users via the CNSS Composite Catalog.

INTRODUCTION

The Virginia Tech seismic network operates with the objective of collecting high-quality seismic data in the southern Appalachians. Research objectives include earthquake monitoring (in part to maintain continuity of earthquake catalogs), seismic hazard assessment, studies of the seismotectonics of the region, earthquake source studies, wave propagation at local and regional distances, crustal structure studies, and the temporal/spatial behavior of seismicity. Service objectives include the publication of an annual seismicity bulletin for the southeastern United States; the development and maintenance of regional earthquake catalogs; and informational service to federal/state/local governments, the engineering community, and the general public.

The stations currently operated by Virginia Tech have been upgraded with three-component sensors, high dynamic range electronics and digital radio telemetry. Calibrated digital waveform data for local and regional seismic events are available on the Internet.

NETWORK OPERATIONS

Virginia Tech operates a calibrated network comprised currently of eight stations (Figure 1). Stations in western Virginia have been upgraded to three-components, with digital radio telemetry and 24-bit digitization. During a portion of the project period, the three station central Virginia subnetwork was recorded digitally using analog telephone telemetry and was supported by contributions from Virginia Power Company, Inc.

Calibrated waveform data are available by anonymous ftp at the following address: **vtso.geol.vt.edu.** The data are also accessible via the world-wide web at **http://www.geol.vt.edu/outreach/vtso/**. This on-line accessible waveform data set consists of events recorded by the network and the high-dynamic-range broadband GSETT-2 seismograph system at Blacksburg, VA, (BLA). A listing of available data can also be gotten from finger, **quake@vtso.geol.vt.edu**. A description of how to access waveform files and calibration files is available at our website, or through more direct communication with the authors. Data from the U. S. National Seismic Network station with downhole broadband sensors are available through the USNSN AutoDRM system.

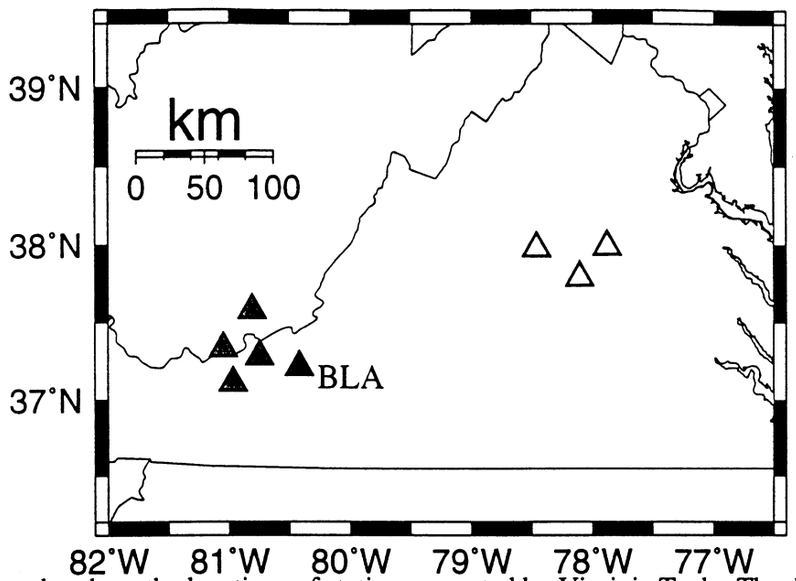

Figure 1. Triangles show the locations of stations operated by Virginia Tech. The three stations in central Virginia are supported by contributions from Virginia Power Company. The Blacksburg, VA station (BLA) includes two broadband, high-dynamic-range, 3-component systems (GSETT-2 and USNSN).

RECENT SEISMICITY IN THE SOUTHEAST

Figure 2 shows the epicenters of earthquakes in the Southeastern U.S. region reported in the 32nd volume of the *Southeastern United States Seismic Network Bulletin*. Also included in the figure are 6 earthquakes in Virginia and West Virginia that occurred in 1998. Calibrated digital waveform data from the Virginia Tech network for a large number of these events (Tables 1 and 2) are available (in SAC format) via the Internet as described above. The events are also listed in the CNSS Composite Catalog.

For Virginia and West Virginia, the past year (October 1, 1997 to October 31, 1998) was less active than the preceding year, which saw 20 earthquakes in the immediate vicinity of the VA Tech network. This year, 10 shocks in the two states were detected and located.

A magnitude Md=2.3 earthquake occurred a few kilometers north of the town of Galax, in southwestern Virginia on October 30, 1997. A similar (Md=2.1) shock occurred in the same area, approximately 10 hours later. Both shocks were felt by many residents of Galax, Fries, and Ivanhoe, Virginia. Another felt event occurred on April 21, 1998 near Free Union, Virginia (M=2.8) and was strongly felt locally (IVMM). The most recent felt event (VI MM) occurred on October 21, 1998 (M=3.8) and was located 7 km north of Farmville, Va. (not plotted in Figure 2).

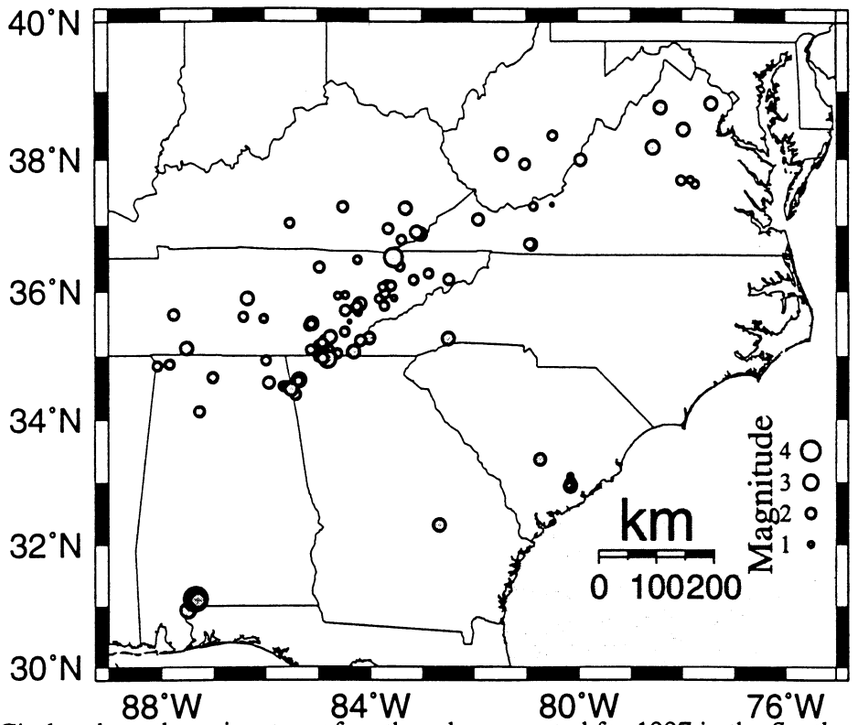

Figure 2. Circles show the epicenters of earthquakes reported for 1997 in the *Southeastern U. S. Seismicity Bulletin 32*. Also shown are 6 additional events occurring in 1998 located by the VA TECH network.

Tables 1 and 2 list the more recent seismic events for which high quality waveform data are readily accessible on-line via anonymous ftp, as described above. Regarding the contributions of the Virginia Tech network toward seismic monitoring in the southern Appalachians, we urge the reader to please note that these lists include events outside the immediate geographic confines of the Virginia Tech network, and in all cases represent an important, but possibly unrecognized calibrated data set. In addition to the significant events listed below, approximately 1900 triggered event files from local, regional and teleseismic sources have been archived during the past year from the telemetered seismic network stations, and long-term, continuous high quality, 6 component (short-period and broadband) data is archived from the GSETT-2 channels at station BLA.

TABLE 1
WAVEFORM DATA ACCESSIBLE IN Subdirectory /events/97/

file	remarks
970421125	Eastern Tennessee, near Vonore, md=2.6
970531431	Fayette Co. WVA, md=2.0 (possibly mining induced)
970740555	Central West Virginia, md=1.8 (possibly mining induced)
970850605	Eastern Tennessee
970881016	Russell Co. VA md=2.3 (possibly mining induced)
971240340	Near Mobile, Al mblg=3.9
971391945	Near Tryon, GA
971510518	Near Charleston, WV (probably mining induced)
971651334	Western North Carolina
971750348	Southwestern Va.

file	remarks
971931335	Giles County, VA md=1.5
972001706	Northwestern GA, mblg=3.6
972050748	Central Virginia md=1.5
972081141	Culpeper Va md=1.1
972081223	Culpeper Va. md=0.8
972081422	Culpeper Va. md=1.1
972081443	Culpeper Va. md=1.1
972081509	Culpeper Va. md=1.4,md=2.5 (two events)
972081552	Culpeper Va. md=1.4
972081229	Eastern TN mblg=3.8
972721745	Northern Virginia (felt in Manassas) md=2.1
972970837	Southern Alabama (mblg 4.9)
972992328	Southern Alabama (aftershock)
973011036	Southwestern VA. md 3.0 (probably mining induced)
973030642	Galax VA md=2.2 (Felt)
973031559	Galax VA md=2.1 (Felt)
973100236	Southern Quebec mblg 4.8
973180344	Lancaster, PA mblg 3.0
973322300	Bolivia: deep focus
973460842	Jasper, Alabama (probably mining induced) mblg bla 4.3
973471539	large mining Blast in West Virginia
973510058	Probable induced event (VA -KY) border area md=2.3
973540721	Probable mining induced event (25 km NW Beckley, WVA)
973540728	Probable mining induced event (25 km NW Beckley, WVA)
973610744	Bath County, VA Md=2.2

TABLE 2

WAVEFORM DATA ACCESSIBLE IN Subdirectory /events/98/

file	remarks
980040425	Hancock Co., TN, mblg 2.7
980340647	Giles County, VA, Md=0.5
981030956	near Camden, SC Mblg=3.9
981061350	Surface Mine Blast
981062126	Surface Mine Blast
981081626	Quebec eq. Mblg=4.1 45.570N -74.990W Neic
981091726	Surface Mine Blast
981112328	Near Charlottesville, VA Md=2.8 (felt)
981160638	Central Va. Md=1.8
981400153	Near Luray, VA, Md=2.4
981560231	Near Charlotte, NC mblg=3.7 (BLA)
981651234	Central Va. Md=1.3
981680801	Oak Ridge TN (mblg=3.8)
982110859	Southern Quebec (mblg=4.0, NEIC)
982421910	Possible mine blast, Ohio
982681953	Pennsylvania: mblg=5.3 (BLA)
982751002	West Virginia: mblg-2.6 (BLA)
982940556	Farmville, Virginia mblg 3.8 (BLA)

CONCLUSIONS

The Virginia Tech seismic network continues to provide modern instrumental coverage of seismicity in the southern Appalachians. The stations have been upgraded with three-component sensors, high-dynamic range capability and digital radio telemetry. Calibrated waveform data in a format compatible with most widely used data analysis software packages are readily available via the Internet. During the past year, 10 earthquakes in Virginia and West Virginia were detected and located. The entire catalog of instrumentally detected and located earthquakes for the southeastern U.S. region is now easily accessible to all users via the CNSS Composite Catalog.

The *Southeastern U. S. Seismicity Bulletin 32* (Southeastern U.S. Seismic Network Operators, 1998) for calendar year 1997 was distributed to 200 institutions and individuals. The southeastern U.S. region seismicity during 1997 included 100 tectonic earthquakes. The Bulletin contains complete phase arrival time data for all stations recording each tectonic earthquake, as well as much additional information on southeastern U.S. seismicity and network operation. Text versions of the Southeastern U.S. Seismicity Bulletins can be obtained electronically at our website, or by anonymous ftp at **vtso.geol.vt.edu.**

The CNSS Composite Catalog (http://quake.geo.berkeley.edu/cnss/) now contains the listing of instrumentally located tectonic earthquake hypocenters and magnitude estimates for the southeastern U.S. region, complete through 1997.

BIBLIOGRAPHY OF PUBLICATIONS RESULTING FROM THIS WORK

Southeastern U.S. Seismic Network Operators (1998). *Southeastern U. S. Seismic Network Bulletin No. 32,* (compiled by M. C. Chapman, E. C. Mathena and J. A. Snoke), Virginia Tech Seismological Observatory, Blacksburg, VA.